

Tomorrow's Performance. Today.

PROMISE Storage Solution for Cloud Datacenter

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PROMISE Milestones



2011 Introduces Pegasus, world's first H/W RAID with *Thunderbolt*. Introduces SmartStor NSx700 NAS

2010 Introduces VTrak S3000 for Cloud Storage Solution, VTrak Ex30f and VessRAID 1840f FC RAID

subsystem

2009 Introduced VessRAID SMB Storage & SmartStor SOHO Storage & SuperTrak EX

6Gb/s RAID Controller

2008 VTrak E-Class Chosen by Apple as Storage Solution Provider

2007 Unveiled VTrak E-Class System & First dlna Certified SmartStor

2006 Launched SmartStor SOHO Storage and VTrak SAS JBOD

2005 Announced VTrak M-Class

2004 World First HW iSCSI RAID Storage

2003 Leads in ATA RAID for IA Server for the 3rd Consecutive Year with 83% Unit Market Share

2002 First six-drive ATA RAID 5 controller, Listed on TSEC.

1998 First RAID chip on MB solution

1997 Released First ATA RAID controller DSP team founded

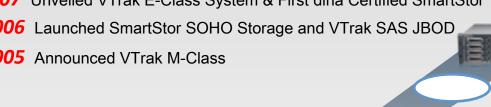
1993 VESA IDE chipset captured 75% of the world's OEM market

1991 PROMISE Taiwan established

1988 Promise Founded in San Jose, US







Cloud Computing and Cloud Storage

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What is Cloud Computing?



 "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Cloud Service Models



Cloud Client (PC, Mobile Devices, etc.)









Web App

eMail

Web Storage

CRM / ERP

Applications - Software as a Service (SaaS)











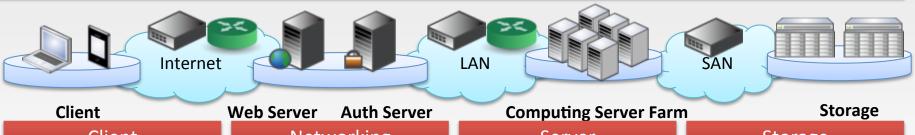
OS

DB

Middleware

Runtime

Computing - Platform as a Service (PaaS)



Client

Networking

Server

Storage

Infrastructure as a Service (IaaS)

Trends that occurred in 2010



- Public Clouds were still shied away from because of security concerns
- Private clouds gained lots of momentum in 2010 and became part of the IT strategy for many enterprises.

Trends that will occur in 2011



- Private clouds will lead the way to public clouds
- Private clouds will provide the security IT admins need, but may use Public Cloud to backup
- Growth of data will continue to be explosive
 - In the past 3 years more data has been created, than all of history
- New installations of storage infrastructure will be installed with the cloud (private or public)

Internet Data Centers & the Cloud



- Almost every laptop today ships with a backup in the cloud solution (Symantec, Mozy, Carbonite, etc.)
 - IDC Actual: 30 million in 2007, 35.5 million in 2008, 41.1 million in 2009 IDC Estimated: 47.5 million in 2010, 54.1 million in 2011, 61.1 million in 2012
- Facebook maintains over 500 million users and created over 350 million in a 36 month period
 - Maintains over 50 Billion images and generates over 25TB of logs per DAY!
- Photobucket handles 23M monthly unique users that upload 4 million pieces of media (photos and videos)
- Estimates indicate that over 330 million smartphones and over 42 million media tablets will be sold 2011.
- The "digital universe" will expand by almost 50%. In 2011, it's predicted that the
 "digital universe" the amount of information and content created and stored
 digitally will grow to 1.8ZB in 2011, up 47% from 2010, and rocketing toward
 over 7ZB by 2015. (IDC)
- Every 2 days, we create as much data as we did in all time since 2003 (~5 exabytes)¹

¹Eric Schmidt @ Technomy conference: http://techcrunch.com/2010/08/04/schmidt-data/

Consumer Driven Content in the Cloud



- For every minute that passes, 24+ hours of video content is uploaded to YouTube
- YouTube has 2 billion views per day
- Hulu+, ABC, CBS, NBC, FOX are all streaming content
- There are 12 Billion devices that can retrieve TV content from the internet
- IDC estimates that 40% of large screen TVs in 2011 will have Ethernet built

How does Storage fit into the Cloud?



- Cloud Storage is just a subset of cloud computing
- Cloud Storage must . . .
 - Have broad network access for easy access
 - Must have rapid elasticity in capacity growth

What are essentials in Cloud Storage?

Elastic

 Quickly adapt underlying infrastructure to ever changing subscriber demands

Automatic

 User and Content management can be placed in different storage tiers, geographic locations depend on the Service Level Agreement (SLA)

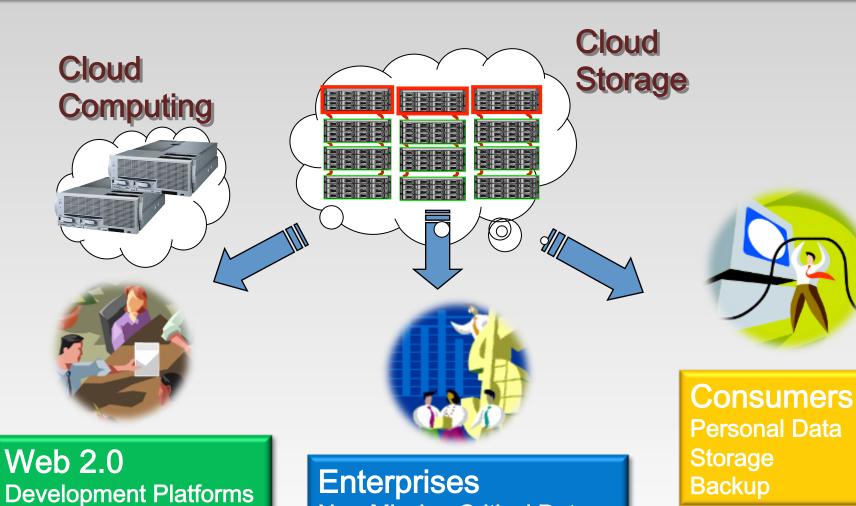
Economic Scale

 multi-tenant and scale out infrastructure, commodity building blocks

Not all application are suitable for Cloud Storage model, Latency is a key consideration

Cloud Storage Markets

Computing and Storage



Non-Mission Critical Data

Secondary Storage

What are the challenges on HCLC drives

- HCLC (High Capacity Low Cost) drives = SATA drivers
- Challenges on SATA drives
 - RVI Poor Vibration resistance
 - Excessive Medium error and long recovery retries
 - Unpredictable behavior e.g. time out, hang...
- Requires smart management

A "Cheap" storage could become very expensive to manage.

What are RAID, HA and Data Services? Which are critical in Cloud Storage?



- RAID is not just providing RAID levels but more...
 - Background activities Media patrol, rebuild, predictive data migration
 - Robustness error handling Manage all challenges in HCLC SATA drives
 - Performance tuning and balancing
 - Event logging and FRU identification and replacement service
 - Green Power management
 - HA
 - High Availability, Redundancy paths/component, NSPOF (No Single Point Of Failure), FO/FB, Load Balancing
 - Data Services
 - Utilization efficiency Backend Storage virtualization, Thin Provisioning
 - Best practice data placement Tiered Storage
 - Data Compression Data Dedupe,
 - Quality of Storage service bandwidth, latency and processing efficiency
 - Data Replications, Disaster Recovery

New VTrak Ex30 for Cloud Storage

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Huge number of servers offering databases to:

WLCG Grid Internal IT Backup and archives

Operating systems:

Red Hat Linux Oracle database systems

Storage Management:

Oracle's ASM
(Automatic Storage Management)
Manages NAS, diskserver and all
attached RAID systems

NAS

CERN uses
FibreChannel SAN
as well as
TCP/IP via Ethernet
Topologies

Capacity oriented
Diskserver as
NFS NAS with SATA HDDSs

RAID Storage Systems with FC 4 Gb/s and SATA HDDs (capacity oriented)

RAID Storage Systems with FC 4 Gb/s and SAS HDDs (performance oriented)

Tape Libriaries with IBM and LTO Technologies

VTrak Connectivity at CERN

Actual installed:

about 80 Ex10f-s with SATA HDDs = 2 PetaByte about 30 Ex10f-s with SAS HDDs = 110 TeraByte

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Several Server (A- and B.Brand(running Ret Hat with Oracle's ASM (Automatic Storage Manager)



Ex10f-s

Ex10f-s

Ex10f-s

Ex10f-s

Ex10f-s

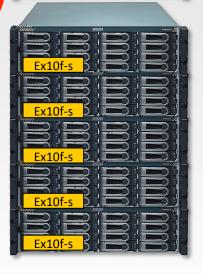
Ex10f-s

Ex10f-s

Ex10f-s

Capacity oriented:
Promise Vtrak's Ex10f-single
2 x FC 4 Gb/s
2 GB Cache
12-16 x SATA 2 TB HDDs
(Western Digital)

Setting:
Virtual JBOD
= 1 LUN per HDD (RAID 0)
PDM/MediaPatrol = active



Performance oriented:
Promise Vtrak's Ex10f-single
2 x FC 4 Gb/s
2 GB Cache
12-16 x SAS 300GB HDDs
(Seagate)

Setting:
Virtual JBOD
= 1 LUN per HDD (RAID 0)
PDM/MediaPatrol = active

VTrak within CERN's IT Center



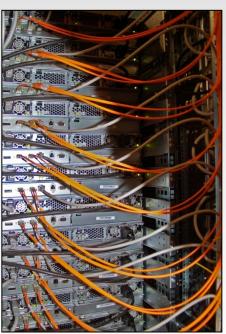
Dr. Olof Barring,
Director CERN Central IT
and 1 PetaByte data capacity
within Promise's VTraks



Another rack with Promise's Vtraks offeres high speed storage with Seagate's 300 GB SAS HDDs to Oracle databases



Rear side fibre channel connectivity to sereval Qlogic's 48port FC switches within CERN's main SAN



40 x Vtrak E310f with 480 WD 2 TB HDDs offered to Oracle's ASM

Internet Data Center

Installation of 7,000+ VTrak chassis with 110,000+ SATA drives totaling 70+ PB of storage and growing since 2007



How does Intel® Xeon® Processor C5500/C3500 Series-based Platform assist in solving Cloud Storage solutions?



- Performance/watt of power has immensely grown with Intel® Xeon® processor C5500/C3500 series. Since up to a 4x performance gain can be seen, it requires less RAID head to get the same amount of work done. This is very important with virtualization platforms as such performance help makes storage consolidation possible.
- Extra CPU and Memory bandwidth has enabled the ability to scale to supporting a larger number of disks (192 with plans to increase) while giving the ability to scale the performance with the growth.

VTrak Ex30/Jx30









- Active/Active dual-controllers
- 8Gb FC, 6Gb SAS, 1Gb iSCSI
- 6Gb SAS or SATA HDD/SSD
- Up to 8GB cache/controller
- Expansion up to 192 drives
- Up to 384TB of raw capacity

- Embedded software management
- RAID 0, 1, 1E, 5, 6, 10, 50, 60
- LFF: 2U/12, 3U/16, 4U/24
- SFF: 2U/24
- SBB 2.0 compliant

Dual Controller

8G FC

12/16/24 HDDs 7 JBOD Expansion

PDM

PROMISE VTrak Features & Functionality

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High-Availability



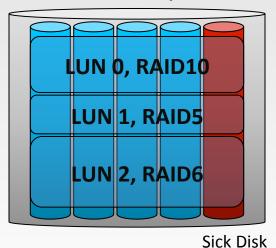
- No single point of failure
 - Redundant controllers, power supplies & cooling fans
 - Hot swappable field replaceable units minimizes downtime
- Seamless controller fail-over & fail-back
- Battery backup unit designed specifically for RAID
 - Designed to retain memory for up to 72 Hours
- UPS monitoring support
 - Protecting your data during a power outage

Sparing Out To Prevent Rebuilds PDM (Predictive Data Migration)



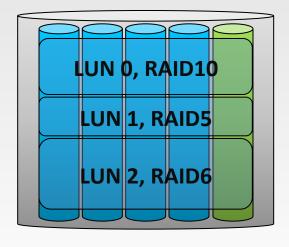
- Avoiding costly rebuild times by detecting potentially failing disks before they fail
 - Migrate data faster to spare drive before the disk goes bad
- Criteria to trigger PDM
 - Exceed the threshold set in SMART monitor.
 - Medium error report exceed threshold
 - Reassign count exceed threshold

Under PDM process





After PDM is done

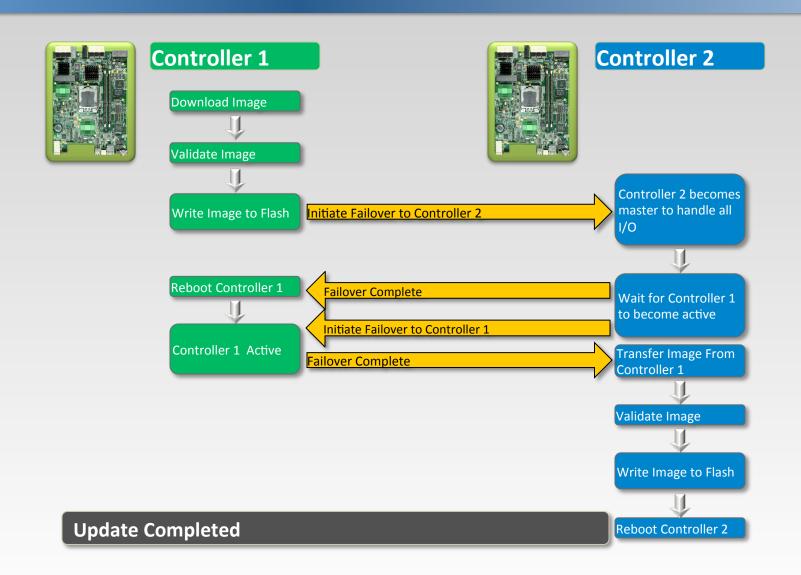




Failed Disk

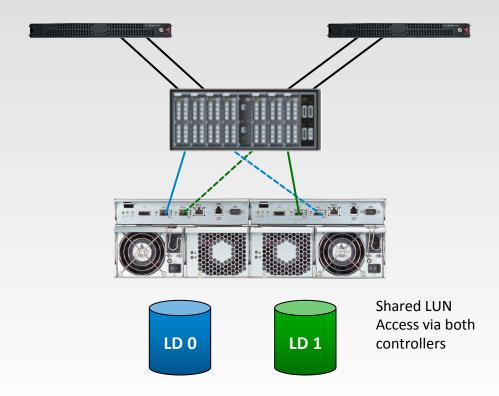
PerfectFlashTM





Asymmetric Logical Unit Access (ALUA)

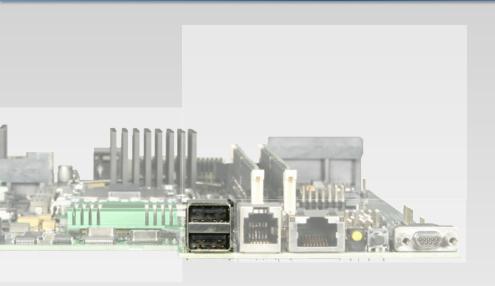
 While in symmetric active-active mode, ALUA will allow a optimized paths and unoptimized paths to be defined



October 2010 PROMISE Confidential

VTrak & USB





- Configuration
 - Auto-configuration using predefined scripts from USB Drive
- Software Update
 - Easy update of subsystem software from USB Drive
- Service Logs
 - Effortlessly store subsystem configuration, event history and other system info
- UPS Support

GreenRAID Technology



What is Green Technology?

 Green storage technology is the technology that enables energy efficiency and waste reduction in storage solutions leading to a overall lower carbon footprint

- PROMISE GreenRAID Features
 - 80Plus Bronze Certified PSU
 - HDD advanced power management (MAID 2.0)



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Efficient Power Supply Units

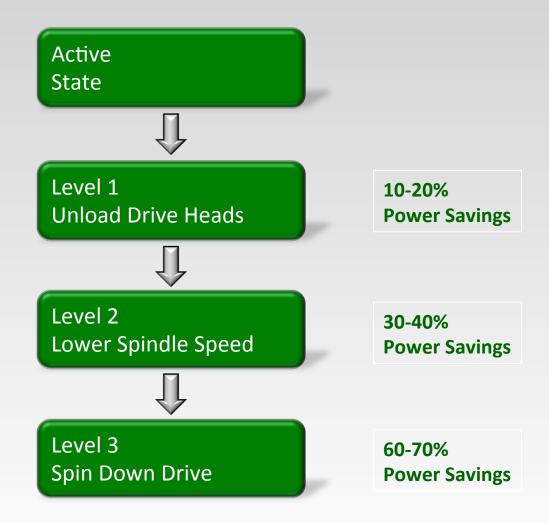




- 580W (3U) PSU
- 750W (4U) PSU
- Power & cooling in a single FRU
- 82% efficient @ 20% load
- 86% efficient @ 50% load

MAID 2.0 Power Management Levels





PROMISE's GreenRAID Story

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- Reduction of hazardous material use
 - Elimination of critically hazardous materials Pb, Cd, Br
 - Reduction of halogens
- Commitment to increase the use of recycled materials
 - Recycled products in packaging materials
- Compliance with industry standards
 - RoHS, WEEE, ISO14001, REACH
 - EITRACK membership
- GreenRAID Technology (previously discussed)
 - 80Plus Bronze Certified PSU
 - HDD Advanced Power Management



Successful Case in Taiwan



- Academia Sinica Grid Computing Center (ASGC) installed 12 sets of VTrak E830 and J830 for datacenter expansion in Q4, 2010
- Each set includes 1 x E830 + 3 x J830, providing over 5,000MB/s Sequential Read and 2,300MB/s Sequential Write performance in RAID 6 mode
- Total capacity is 2TB HDD x 1,152 = 2.3PB raw storage
- Benefits: deliver 2X performance with ½ of RAID controllers compares to existing configuration
- Excellent price/performance value and \$/ GB ratio



Summary



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Why PROMISE Storage?

Performance

Hosts response times need to remain optimal, while the cloud environment grows, maintain QoS.

Value

Low TCA and affordable support structure is required to enable the provider to offer their service at a competitive market price

Availability

SLAs guarantee access uptimes to subscribers, requiring the use of fully redundant hardware and disaster recovery/site failover strategies should there be a natural disaster impacting loca resources



Elasticity

Ability to deliver services to meet changing requirements

Scalability

Server and storage resources continue to meet performance and availability SLAs as the user/ customer base grows

Reliability

Industry proven fully redundant hardware latform

Availability

PROMISE Products for Cloud Storage



ARCHIVING/DR Site

PRIVATE CLOUD

VTrak Ex30

- •IOP Performance
- Scalability
- High Availability
- Reliability
- Manageability
- Energy efficiency
- Simplicity
- •Fibre Channel host connectivity

PUBLIC CLOUD



VTrak S3000

- Storage Virtualization
- Scalability
- IOP Performance
- Elasticity
- Data mobility
- High Availability
- Site-failover/redundancy
- •Fibre Channel and iSCSI host connectivity

VessRAID

- Capacity/Simplicity
- •Single point of failure reliability
- Energy efficiency
- •Low cost compliance storage
- •Flexible converged interfaces: Fibre Channel/ iSCSI/NAS host connectivity



VTrak Ex10

- Capacity/Flexibility
- High Availability
- Reliability
- Manageability
- Simplicity
- •SAS/Fibre Channel host connectivity

Scalability

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Thank You!